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WHAT IS CLAIMED IS:

1. An olefin polymerization catalyst, which comprises:

- 5 (A) a transition metal compound or lanthanoid compound containing two or more atoms selected from the group consisting of boron, nitrogen, oxygen, phosphorus, sulfur, and selenium; and  
(B) a Lewis acid.

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2. An olefin polymerization catalyst, which comprises:

- (A) a transition metal compound or lanthanoid compound containing two or more atoms selected from the group consisting  
15 of boron, nitrogen, oxygen, phosphorus, sulfur, and selenium;  
(B) a Lewis acid; and  
(C) an oxygen-containing compound or nitrogen-containing compound.

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3. The olefin polymerization catalyst according to claim 1 or claim 2, wherein the catalyst is prepared from  
(A) a transition metal compound or lanthanoid compound containing two or more atoms selected from the group consisting  
of boron, nitrogen, oxygen, phosphorus, sulfur, and selenium;

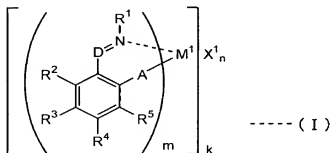
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(B) a Lewis acid;

(C) an oxygen-containing compound or nitrogen-containing compound; and optionally

(D) an inactivating compound which is capable of reacting with  
 5 said oxygen-containing compound or nitrogen-containing  
 compound (C) to make the oxygen-containing compound or  
 nitrogen-containing compound inactive to the compound (A).

4. The olefin polymerization catalyst according to  
 10 claim 1 or 3, wherein the transition metal compound or lanthanoid  
 compound (A) is selected from the compounds represented by  
 General Formulas (I) to (XXXII):



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(In Formula (I),  $\text{M}^1$  represents a transition metal atom selected  
 from Groups 3-11 of Periodical Table;

$k$  represents an integer of 1-6;

$m$  represents an integer of 1-6;

20 A represents an oxygen atom, a sulfur atom, a selenium atom,

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or a nitrogen atom having a substituent  $-R^6$ ;

D represents a nitrogen atom, a phosphorus atom, or a carbon atom having a substituent  $-R^7$ ;

$R^1-R^7$  may be the same or different and  $R^1-R^7$  represent a hydrogen

atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a

nitrogen-containing group, a boron-containing group, a

sulfur-containing group, a phosphorus-containing group, a

silicon-containing group, a germanium-containing group, or a

tin-containing group; and two or more thereof may be joined together to form one or more rings; when m is 2 or more, two

or more of  $R^1$  groups, of  $R^2$  groups, of  $R^3$  groups, of  $R^4$  groups, of  $R^5$  groups, of  $R^6$  groups, and of  $R^7$  groups may be the same

or different; and when m is 2 or more, one of the  $R^1-R^7$  groups

in one ligand and one of the  $R^1-R^7$  groups in another ligand may form a bonding group or a single bond; and a heteroatom contained

in the  $R^1-R^7$  groups may be coordinated with  $M^1$  or bonded to  $M^1$ ;

n represents a number satisfying the valence of  $M^1$ ;

$X^1$  represents a hydrogen atom, a halogen atom, an oxygen atom,

a hydrocarbon group, an oxygen-containing group, a

sulfur-containing group, a nitrogen-containing group, a

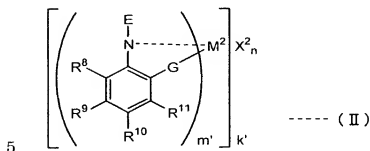
boron-containing group, an aluminum-containing group, a

phosphorus-containing group, a halogen-containing group, a

heterocyclic compound residue, a silicon-containing group, a

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germanium-containing group, or a tin-containing groups; the plural  $X^1$  groups may be the same or different and may be joined together to form one or more rings when  $n$  is 2 or more.)



(In Formula (II),  $M^2$  represents a transition metal atom selected from Groups 3-11 of Periodical Table;

$k'$  represents an integer of 1-6;

10  $m'$  represents an integer of 1-6;

$G$  represents an oxygen atom, a sulfur atom, a selenium atom, or a nitrogen atom having a substituent  $-R^{12}$ ;

$E$  represents  $-R^{13}$  and  $-R^{14}$  both bonding to  $N$ , or  $=C(R^{15})R^{16}$ ;

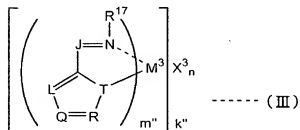
$R^8-R^{16}$  may be the same or different and  $R^8-R^{16}$  represent a hydrogen  
15 atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a  
20 tin-containing group; and two or more thereof may be joined together to form one or more rings (the ring excluding aromatic

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rings formed by joining of  $R^8$  and  $R^{13}$  or  $R^8$  and  $R^{14}$ ); one of the  $R^8$ - $R^{16}$  groups in one ligand and one of the  $R^8$ - $R^{16}$  groups in another ligand may form a bonding group or a single bond when  $m'$  is 2 or more; two or more of  $R^8$  groups, of  $R^9$  groups, of  $R^{10}$  groups, of  $R^{11}$  groups, of  $R^{12}$  groups, of  $R^{13}$  groups, of  $R^{14}$  groups, of  $R^{15}$  groups, and of  $R^{16}$  groups may be the same or different; and a heteroatom contained in the  $R^8$ - $R^{16}$  groups may be coordinated with  $M^2$  or bonded to  $M^2$ ;

$n$  represents a number satisfying the valence of  $M^2$ ; and

$X^2$  represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing groups; and the plural  $X^2$  groups may be the same or different and may be joined together to form one or more rings when  $n$  is 2 or more.)



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(In Formula (III),  $M^3$  represents a transition metal atom selected from Groups 3-11 of Periodical Table;

$k$  represents an integer of 1-6;

$m$  represents an integer of 1-6;

5 J represents a nitrogen atom, a phosphorus atom, or a carbon atom having a substituent  $-R^{18}$ ;

T represents a nitrogen atom, or a phosphorus atom;

L represents a nitrogen atom, a phosphorus atom, or a carbon atom having a substituent  $-R^{19}$ ;

10 Q represents a nitrogen atom, a phosphorus atom, or a carbon atom having a substituent  $-R^{20}$ ;

R represents a nitrogen atom, a phosphorus atom, or a carbon atom having a substituent  $-R^{21}$ ;

$R^{17}-R^{21}$  may be the same or different and  $R^{17}-R^{21}$  represent a hydrogen

15 atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a

nitrogen-containing group, a boron-containing group, a

sulfur-containing group, a phosphorus-containing group, a

silicon-containing group, a germanium-containing group, or a

20 tin-containing group; and two or more thereof may be joined together to form one or more rings; one of the groups of  $R^{17}-R^{21}$

in one ligand and one of the groups of  $R^{17}-R^{21}$  in another ligand

may form a bonding group or a single bond when  $m$  is 2 or more;

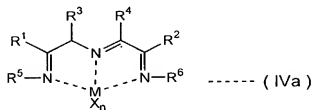
two or more of  $R^{17}$  groups, of  $R^{18}$  groups, of  $R^{19}$  groups, of  $R^{20}$

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groups, and of  $R^{21}$  groups may be the same or different; and a heteroatom contained in the  $R^{17}$ - $R^{21}$  groups may be coordinated with  $M^3$  or bonded to  $M^3$ ;

$n$  represents a number satisfying the valence of  $M^3$ ;

- 5  $X^3$  represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing groups; and the plural  $X^3$  groups may be the same or different and may be joined together to form one or more rings when  $n$  is 2 or more.)
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(In Formula (IVa),  $M$  represents a transition metal atom selected from Groups 3-7 of Periodical Table;

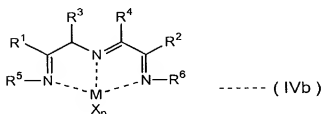
- $R^1$ - $R^6$  may be the same or different and  $R^1$ - $R^6$  represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a
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sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined together to form an aromatic ring, an aliphatic ring, or a heteroatom-containing hydrocarbon ring, and the ring may have one or more additional substituents;

n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing groups; the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)



(In Formula (IVb), M represents a transition metal atom selected from Groups 8-11 of Periodical Table;



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$R^1$ - $R^6$  may be the same or different and  $R^1$ - $R^6$  represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a

nitrogen-containing group, a boron-containing group, a  
5 sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined together to form an aromatic ring, an aliphatic ring, or a heteroatom-containing hydrocarbon ring, and the ring may have

10 one or more additional substituents;

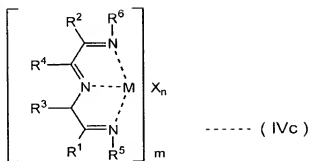
n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an

15 aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing groups; the plural X groups may be the same or different and may be joined together to form one or more rings

20 when n is 2 or more.)

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(In Formula (IVc), M represents a transition metal atom selected from Groups 3-11 of Periodical Table;

5 m represents an integer of 1-6;

R<sup>1</sup>-R<sup>6</sup> may be the same or different and R<sup>1</sup>-R<sup>6</sup> represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a

10 sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined together to form an aromatic ring, an aliphatic ring, or a heteroatom-containing hydrocarbon ring, and the ring may have  
15 one or more additional substituents;

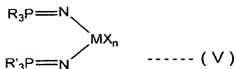
n represents a number satisfying the valence of M; and

X represents an oxygen atom when n is 1, and when n is 2 or more, at least one X is an oxygen atom, and other X is a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an

20 oxygen-containing group, a sulfur-containing group, a

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nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing groups; the plural X groups may be the same or different and may be joined together to form one or more rings.)



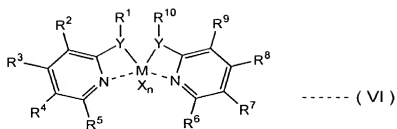
10 (In Formula (V), M represents a transition metal atom selected from Groups 3-6 of Periodic Table;

R and R' may be the same or different and R and R' represent a hydrogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an organic silyl group, or a substituent having at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and silicon;

n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)

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(In Formula (VI), M represents a transition metal atom selected

5 from Groups 4 or 5 of Periodic Table;

$R^1-R^{10}$  may be the same or different and  $R^1-R^{10}$  represent a hydrogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an organic silyl group, or a hydrocarbon group substituted with a substituent having at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and silicon; and the groups of  $R^1-R^{10}$  may be joined together to form one or more rings;

n represents a number satisfying the valence of M;

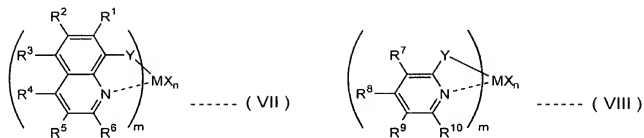
X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, a halogenated hydrocarbon group, an

15 oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural X groups may be the same or different when n is 2 or more; and

Y represents an atom of Group 15 or 16 of Periodic Table.)

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(In Formulas (VII) and (VIII), M represents a transition metal atom selected from Groups 4 or 5 of Periodic Table;

- 5 R<sup>1</sup>-R<sup>6</sup> and R<sup>7</sup>-R<sup>10</sup> may be the same or different and R<sup>1</sup>-R<sup>6</sup> and R<sup>7</sup>-R<sup>10</sup> represent a hydrogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an organic silyl group, or a hydrocarbon group substituted with a substituent having at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and
- 10 silicon; and any of the R<sup>1</sup>-R<sup>6</sup> groups and the R<sup>7</sup>-R<sup>10</sup> groups may be joined together to form one or more rings;

m represents an integer of 1-6;

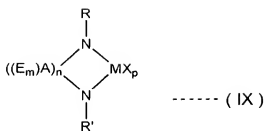
n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom,

- 15 a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural X groups may be the same or different when n is 2 or more; and

- 20 Y represents an atom of Group 15 or 16 of Periodic Table.)

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(In Formula (IX), M represents a transition metal atom selected from Groups 3-6 of Periodic Table;

5 R and R' may be the same or different and R and R' represent a hydrogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an organic silyl group, or a substituent having at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and silicon;

10 m represents an integer of 0-2;

n represents an integer of 1-5;

A represents an atom of Group 13-16 of Periodic Table, and when n is 2 or more, the plural A atoms may be the same or different;

15 E represents a substituent having at least one element selected from carbon, hydrogen, oxygen, halogen, nitrogen, sulfur, phosphorus, boron, and silicon; the plural E substituents may be the same or different, and two or more of the E substituents may be joined together to form one or more rings;

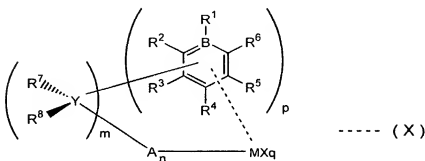
p is a number satisfying the valence of M;

20 X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, a halogenated hydrocarbon group, an

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oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural X groups may be the same or different when p is 2 or more.)

5



(In Formula (X), M represents a transition metal atom selected from Groups 3-11 of Periodic Table;

10 m represents an integer of 0-3;

n represents an integer of 0-1;

p represents an integer of 1-3;

R<sup>1</sup>-R<sup>8</sup> may be the same or different and R<sup>1</sup>-R<sup>8</sup> represent a hydrogen atom, a halogen atom, a hydrocarbon group, a halogenated

15 hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group, and two or more thereof may be joined together to form one or more rings;

q represents a number satisfying the valence of M;

20 X represents a hydrogen atom, a halogen atom, an oxygen atom,

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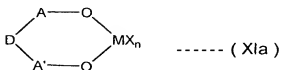
a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural X groups may be the same or different when q is 2 or

5 more;

Y represents a group forming a bridge between A and a boratabenzene ring when m is 1-3, and is a carbon atom, a silicon atom, or a germanium atom; and

A is an atom of Groups 14-16 of Periodic Table.)

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(In Formula (X1a), M represents a transition metal atom selected from Groups 3-11 of Periodic Table;

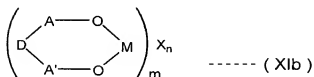
15 A and A' may be the same or different and A and A' represent a hydrocarbon group, a halogenated hydrocarbon group; a hydrocarbon group having an oxygen-containing group, a sulfur-containing group, or a silicon-containing group; a  
 20 halogenated hydrocarbon group having an oxygen-containing group, a sulfur-containing group, or a silicon-containing group;

D may be present or absent, and when present, D is a group forming a bridge between A and A', D represents a hydrocarbon group,



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a halogenated hydrocarbon group, an oxygen atom, a sulfur atom, or a group represented by  $R^1R^2Z$  ( $R^1$  and  $R^2$  may be the same or different and  $R^1$  and  $R^2$  represents a hydrocarbon group or a hydrocarbon group containing at least one heteroatom, and may be joined together to form a ring, and  $Z$  represents a carbon atom, a nitrogen atom, a sulfur atom, a phosphorus atom, or a silicon atom), and  $A$  and  $A'$  may be directly bonded;  $n$  represents a number satisfying the valence of  $M$ ;  $X$  represents a hydrogen atom, a halogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural  $X$  groups may be the same or different and may be joined together to form one or more rings when  $n$  is 2 or more.)



(In Formula (XIb),  $M$  represents a transition metal atom selected from Groups 3-11 of Periodic Table;

$m$  represents an integer of 1-6;

$A$  and  $A'$  may be the same or different and  $A$  and  $A'$  represent a hydrocarbon group, a halogenated hydrocarbon group; a

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hydrocarbon group having an oxygen-containing group, a sulfur-containing group, or a silicon-containing group; or a halogenated hydrocarbon group having an oxygen-containing group, a sulfur-containing group, or a silicon-containing group;

D may be present or absent, and when present, D is a group forming a bridge between A and A', D represents a hydrocarbon group, a halogenated hydrocarbon group, an oxygen atom, a sulfur atom, or a group represented by  $R^1R^2Z$  ( $R^1$  and  $R^2$  may be the same or different and  $R^1$  and  $R^2$  represents a hydrocarbon group or a hydrocarbon group containing at least one heteroatom, and may be joined together to form a ring, and Z represents a carbon atom, a nitrogen atom, a sulfur atom, a phosphorus atom, or a silicon atom); and

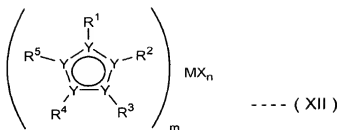
A and A' may be directly bonded;

n represents a number satisfying the valence of M;

X represents an oxygen atom when n is 1, and at least one X is an oxygen atom, and other X is a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, a halogenated

hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group when n is 2 or more; the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)

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(In Formula (XII), M represents a transition metal atom selected

5 from Groups 3-11 of Periodic Table;

Y may be the same or different, Y represents an atom of Group 13-15 of Periodic Table and at least one of the Y atoms is other than carbon;

m represents an integer of 1-6;

10 R<sup>1</sup>-R<sup>5</sup> are present when the atom Y to be bonded thereto is an atom of Group 14 of Periodic Table, and may be the same or different and represent a hydrogen atom, a halogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an organic silyl group, or a hydrocarbon group substituted with a substituent containing  
15 at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and silicon; and two or more of the groups R<sup>1</sup>-R<sup>5</sup> may be joined to form one or more rings;

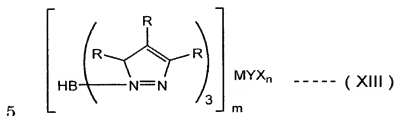
n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom,

20 a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a

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silicon-containing group, or a nitrogen-containing group; the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)



(In Formula (XIII), M represents a transition metal atom selected from Groups 3-11 of Periodic Table;

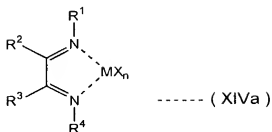
m represents an integer of 1-6;

10 R may be the same or different and R represents a hydrogen atom, a hydrocarbon group, or a halogenated hydrocarbon group; two or more thereof may be joined together to form one or more rings; n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom, 15 a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more; and

20 Y may be present or absent, and when present, Y is an atom selected from the atoms of Groups 15 and 16 of Periodic Table.)

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(In Formula (XIVa), M represents a transition metal atom selected

5 from Groups 3-7 and 11 of Periodic Table;

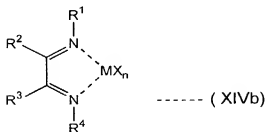
$R^1$ - $R^4$  represent a hydrocarbon group, a halogenated hydrocarbon group, an organicsilyl group, or a hydrocarbon group substituted with a substituent containing at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and silicon; two

10 or more of  $R^1$ - $R^4$  may be joined to form one or more rings;

n represents a number satisfying the valence of M; and

X represents a hydrogen atom, a halogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group,

15 or a nitrogen-containing group; the plural X groups may be the same or different when n is 2 or more.)



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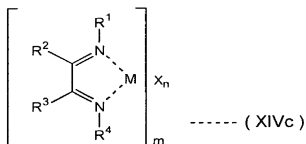
(In Formula (XIVb), M represents a transition metal atom selected from Groups 8-10 of Periodic Table;

$R^1-R^4$  may be the same or different and  $R^1-R^4$  represent a hydrocarbon group, a halogenated hydrocarbon group, an organic silyl group, or a hydrocarbon group substituted with one or more substituents containing at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and silicon; two or more of the  $R^1-R^4$  groups may be joined to form one or more rings;

n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural X groups may be the

same or different when n is 2 or more.)



(In Formula (XIVc), M represents a transition metal atom selected from Groups 3-11 of Periodic Table;

m represents an integer of 1-6;

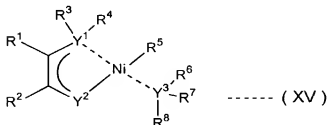
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$R^1-R^4$  may be the same or different and represent a hydrocarbon group, a halogenated hydrocarbon group, an organic silyl group, or a hydrocarbon group substituted with one or more substituents containing at least one element selected from nitrogen, oxygen, phosphorus, sulfur, and silicon; two or more of the  $R^1-R^4$  groups may be joined to form one or more rings;

$n$  represents a number satisfying the valence of  $M$ ;

$X$  represents an oxygen atom when  $n$  is 1; when  $n$  is 2 or more, at least one  $X$  represents an oxygen atom, and the rest of the

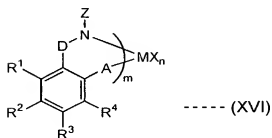
$X$  represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, or a nitrogen-containing group; the plural  $X$  groups may be the same or different when  $n$  is 2 or more.)



(In Formula (XV),  $Y^1$  and  $Y^3$  represent respectively an atom of Group 15 of Periodic Table, and  $Y^2$  represents an atom of Group 16 of Periodic Table;

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$R^1-R^8$  may be the same or different and represent a hydrogen atom, a halogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, or a silicon-containing group; two or more of thereof may be  
 5 joined to form one or more rings.)



(In Formula (XVI), M represents a transition metal atom selected  
 10 from Groups 3-11 of Periodic Table;

m represents an integer of 1-6;

A represents an oxygen atom, a sulfur atom, a selenium atom, or a nitrogen atom having a substituent  $-R^5$ ;

D represents a group of  $-C(R^6)(R^7)-$ ,  $-Si(R^8)(R^9)-$ ,  $-P(O)(R^{10})-$ ,  
 15  $-P(R^{11})-$ ,  $-SO-$ , or  $-S-$ ;

Z represents groups of  $-R^{12}$  and  $-R^{13}$  both bonding to N,  $=C(R^{14})R^{15}$ , or  $=NR^{16}$ ;

$R^1-R^{16}$  may be the same or different and represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic  
 20 compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a



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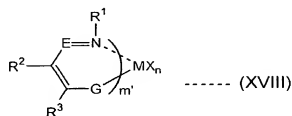
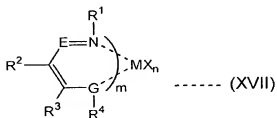
sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined together to form one or more rings; when m is 2 or more, two

5 of the  $R^1$ - $R^{16}$  groups may be linked together;

n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a

10 boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; the plural X groups may be the same or different and may be joined  
15 together to form one or more rings when n is 2 or more.)



(In Formulas (XVII) and (XVIII), M represents a transition metal

20 atom selected from Groups 3-11 of Periodic Table;

m represents an integer of 1-3;

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m' represents an integer of 1-6;

E represents a nitrogen atom, or a carbon atom having a substituent -R<sup>5</sup>;

G represents an oxygen atom, a sulfur atom, a selenium atom,

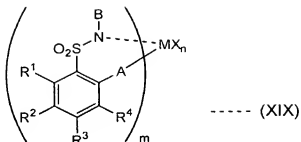
5 or a nitrogen atom having a substituent -R<sup>6</sup>;

R<sup>1</sup>-R<sup>6</sup> may be the same or different and represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, 10 a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined together to form one or more rings; two of the groups R<sup>1</sup>-R<sup>6</sup> may be linked together when m or m' is 2 or more;

15 n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a 20 heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)

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(In Formula (XIX), M represents a transition metal atom selected

5 from Groups 3-11 of Periodic Table;

m represents an integer of 1-6;

A represents an oxygen atom, a sulfur atom, a selenium atom,  
or a nitrogen atom having a substituent  $-R^5$ ;

B represents groups of  $-R^6$  and  $-R^7$  both bonding to N,  $=C(R^8)R^9$ ,

10 or  $=NR^{10}$ ;

$R^1-R^{10}$  may be the same or different and represent a hydrogen  
atom, a halogen atom, a hydrocarbon group, a heterocyclic  
compound residue, an oxygen-containing group, a  
nitrogen-containing group, a boron-containing group, a

15 sulfur-containing group, a phosphorus-containing group, a  
silicon-containing group, a germanium-containing group, or a  
tin-containing group; and two or more thereof may be joined  
together to form one or more rings; when m is 2 or more, one

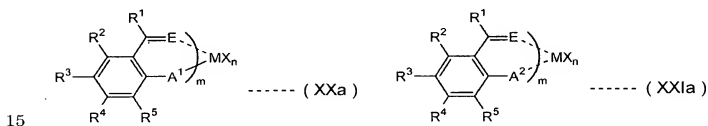
of the  $R^1-R^{10}$  groups of one ligand and one of the  $R^1-R^{10}$  groups  
20 of another ligand may be linked together, and two or more of  
the  $R^1$  groups, of the  $R^2$  groups, of the  $R^3$  groups, of the  $R^4$

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groups, of the  $R^5$  groups, of the  $R^6$  groups, of the  $R^7$  groups, of the  $R^8$  groups, of the  $R^9$  groups, or of the  $R^{10}$  groups may be the same or different;

n represents a number satisfying the valence of M;

- 5 X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a
- 10 heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)



(In Formulas (XXa) and (XXIa), M represents a transition metal atom selected from Groups 3 and 4 of Periodic Table;

- $A^1$  represents an oxygen atom, a sulfur atom, or a
- 20 hydrocarbon-substituted nitrogen atom;

$A^2$  represents a hydrocarbon-substituted oxygen atom, a

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hydrocarbon-substituted sulfur atom, or a

hydrocarbon-substituted nitrogen atom;

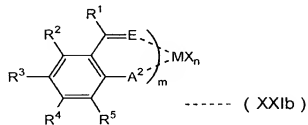
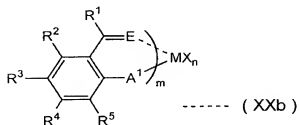
E represents an oxygen atom, or a sulfur atom;

m represents an integer of 1-2;

- 5  $R^1-R^5$  may be the same or different and represent a hydrocarbon group, a hydrogen atom, or a hydrocarbon-substituted silyl group;

n represents a number satisfying the valence of M;

- X represents a hydrogen atom, a halogen atom, an oxygen atom,  
 10 a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a  
 15 germanium-containing group, or a tin-containing group; and the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)



20

(In Formulas (XXb) and (XXIb), M represents a transition metal

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atom selected from Groups 5-11 of Periodic Table.

A<sup>1</sup> represents an oxygen atom, a sulfur atom, or a hydrocarbon-substituted nitrogen atom;

A<sup>2</sup> represents a hydrocarbon-substituted oxygen atom, a  
5 hydrocarbon-substituted sulfur atom, or a hydrocarbon-substituted nitrogen atom;

E represents an oxygen atom, or a sulfur atom;

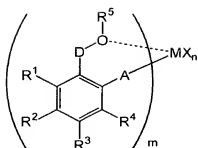
m represents an integer of 1-2;

R<sup>1</sup>-R<sup>5</sup> may be the same or different and represent a hydrocarbon  
10 group, a hydrogen atom, or a hydrocarbon-substituted silyl group;

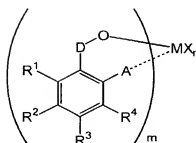
n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a  
15 sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; the  
20 plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)

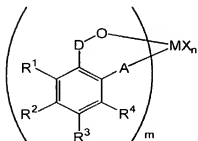
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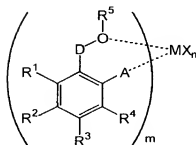
..... (XXII)



..... (XXIII)



..... (XXIV)



..... (XXV)

(In Formulas (XXII), (XXIII), (XXIV), and (XXV), M represents a transition metal atom selected from Groups 3-11 of Periodic

5 Table;

m represents an integer of 1-6;

A represents an oxygen atom, a sulfur atom, a selenium atom, or a nitrogen atom and A may have a substituent R<sup>6</sup> depending on the mode of bonding to the metal M;

10 D represents a group of -C(R<sup>7</sup>)(R<sup>8</sup>)-, -Si(R<sup>9</sup>)(R<sup>10</sup>)-, -CO-, -SO<sub>2</sub>-, -SO-, or -P(O)(OR<sup>11</sup>);

R<sup>1</sup>-R<sup>11</sup> may be the same or different and represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a

15 nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a

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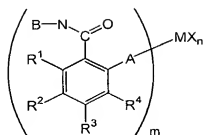
silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined together to form one or more rings; and when m is 2 or more, two of the groups represented by  $R^1$ - $R^{11}$  groups may be linked, and each of the  $R^1$ - $R^{11}$  groups may be the same or different independently;

n is a number satisfying the valence of M;

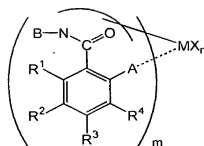
X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; and the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)



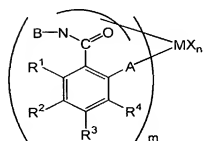
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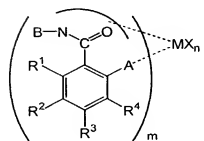
..... (XXVI)



..... (XXVII)



..... (XXVIII)



..... (XXIX)

(In Formulas (XXVI), (XXVII), (XXVIII), and (XXIX), M represents a transition metal atom selected from Groups 3-11 of Periodic

5 Table;

m represents an integer of 1-6;

A represents an oxygen atom, a sulfur atom, a selenium atom, or a nitrogen atom; the atom A may have a substituent R<sup>5</sup> depending on the mode of bonding to the metal M;

10 B represents groups of -R<sup>6</sup> and -R<sup>7</sup> both bonding to N, =NR<sup>8</sup>, or =CR<sup>9</sup>R<sup>10</sup>;

R<sup>1</sup>-R<sup>10</sup> may be the same or different and represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a

15 nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a

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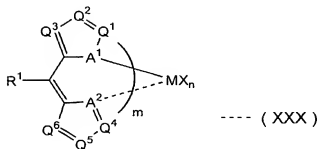
silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined together to form one or more rings; when m is 2 or more, two of the  $R^1$ - $R^{10}$  groups may be linked together, and the each  $R^1$ - $R^{10}$

5 group may be the same or different;

n represents a number satisfying the valence of M;

X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a

10 boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; and the plural X groups may be the same or different and may be joined together to form one or more rings when n is 2 or more.)



(In Formula (XXX), M represents a transition metal atom

20 selected from Groups 3-11 of Periodic Table;

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$A^1$  and  $A^2$  may be the same or different and represent a nitrogen atom or a phosphorus atom;

$Q^1-Q^6$  may be the same or different and represent a nitrogen atom, a phosphorus atom, or a carbon atom having a substituent  $-R^2$ ;

5 when two or more of  $Q^1-Q^6$  have respectively a carbon atom having an  $R^2$ -substituent, the  $R^2$  substituents may be the same or different;

$R^1$  and  $R^2$  may be the same or different and represent a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic

10 compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a tin-containing group; and two or more thereof may be joined  
15 together to form one or more rings;

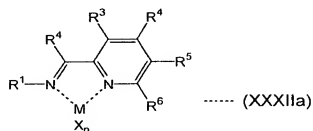
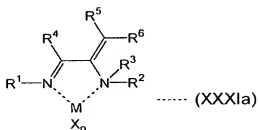
$m$  represents an integer of 1-6; when  $m$  is 2 or more, any of  $R^1$  and  $R^2$  of one ligand and any of  $R^1$  and  $R^2$  in another ligand may be linked together, and the plural  $R^1$  groups, and the plural  $R^2$  groups may respectively be the same or different;

20  $n$  represents a number satisfying the valence of  $M$ ;

$X$  represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a

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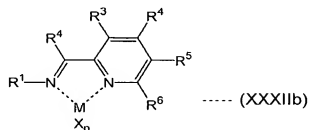
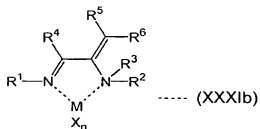
phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; and the plural X groups may be the same or different and may be joined  
 5 together to form one or more rings when n is 2 or more.)



(In Formulas (XXXIa) and (XXXIIa), M represents a transition  
 10 metal atom selected from Groups 3-7 of Periodic Table;  
 R<sup>1</sup>-R<sup>6</sup> may be the same or different and represent a hydrogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, a nitrogen-containing group, or a  
 15 phosphorus-containing group; and two or more thereof may be joined together to form one or more rings;  
 n represents a number satisfying the valence of M;  
 X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a  
 20 sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a

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phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; and the plural X groups may be the same or different and may be joined to form one or more rings when n is 2 or more.)



(In Formulas (XXXIb) and (XXXIIb), M represents a transition metal atom selected from Groups 8-11 of Periodic Table; R<sup>1</sup>-R<sup>6</sup> may be the same or different and represent a hydrogen atom, a hydrocarbon group, a halogenated hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a silicon-containing group, a nitrogen-containing group, or a phosphorus-containing group; and two or more thereof may be joined together to form one or more rings; n represents a number satisfying the valence of M; X represents a hydrogen atom, a halogen atom, an oxygen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a

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phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group, or a tin-containing group; and the plural X groups may be the same or different and may be joined  
5 to form one or more rings when n is 2 or more.)

5. The olefin polymerization catalyst according to any of claims 1 to 4, wherein the Lewis acid (B) is at least one selected from the group of compounds (b-1) to (b-4) below:

- 10 (b-1) ionic-bonding compounds having a  $\text{CdCl}_2$  type or a  $\text{CdI}_2$  type of layered crystal structure;  
(b-2) clays, clay minerals, or ion-exchange layered compounds;  
(b-3) heteropoly-compounds; and  
(b-4) halogenated lanthanoid compounds.

15

6. The olefin polymerization catalyst according to claim 5, wherein the Lewis acid (B) is at least one halogen compound selected from halogenated magnesium compounds, halogenated manganese compounds, halogenated iron compounds,  
20 halogenated cobalt compounds, and halogenated nickel compounds.

7. A process for producing olefin polymer, comprising homopolymerizing an olefin or copolymerizing olefins in the

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presence of the olefin polymerization catalyst as claimed in any of claims 1 to 6, and optionally (E) an organic aluminum compound.